FAMILY OF LOW DROP FIXED AND ADJUSTABLE VOLTAGE REGULATORS OF POSITIVE POLARITY

DESCRIPTION

The IL52XXG is a low drop voltage regulator which is able to provide output current up to 800mA even in adjustable version (Vref=1.25V). There are offered the following output voltages: 1.2 V (IL5212G), 1.8 V (IL5218G), 2.5 V (IL5225G), 2.85 V (IL5228G), 3.0 V (IL5230G), 3.3 V (IL5233G), 5.0 V(IL5250G) in fixed versions. The 2.85V device is ideal for SCSI-2 lines active termination. The device is supplied in: SOT-223, surface mount packages which provide optimal thermal characteristics plus space saving effect. NPN pass transistor provide high efficiency, unlike than PNP transistor, the quiescent current flows mostly into the load. Only a common capacitor (10µF minimum) is needed for stability. On chip trimming allows the regulator to reach high accuracy of output voltage, within ± 1% at 25°C.

The adjustable voltage regulator IL5200G is pin to pin compatible with the other standard.

Adjustable voltage regulators provide the better performances in terms of drop and accuracy.
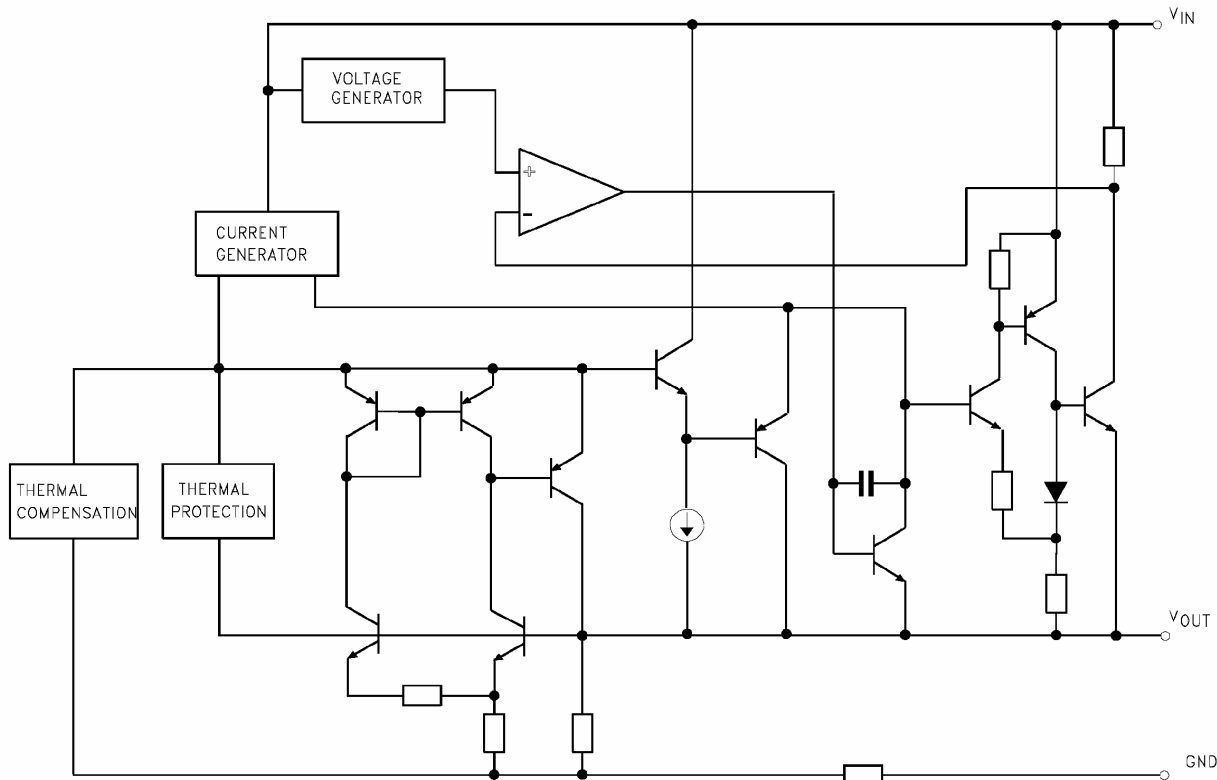
Features

- Low dropout voltage (1V typ.)
- 2.85V device is perfect for SCSI-2 active termination
- Output current up to 800 mA
- Fixed output voltage of: 1.2V, 1.8V, 2.5V, 2.85V, 3.0V, 3.3V, 5.0V
- Adjustable version availability (V_{rel}=1.25V);
- Internal current and thermal limit
- Available in ± 1% (at 25°c) and 2% in full temperature range
- Supply voltage rejection: 75db (typ.)

SOT-223

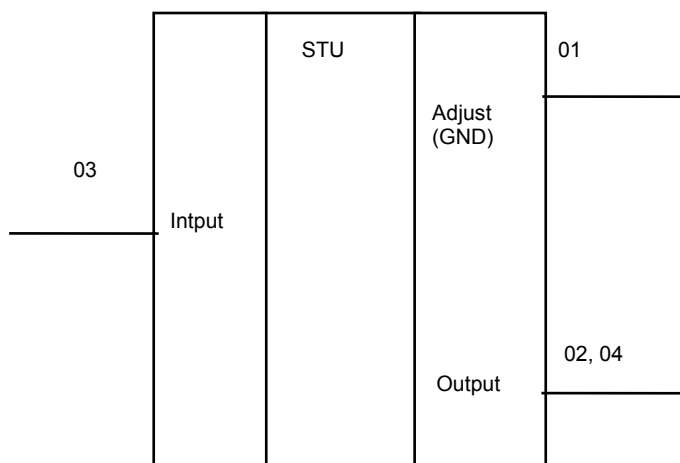## Block Diagram

Drawing designation

Pin description table for IL52XXG ICs family

Pin number	Pad number	Symbol	Functional purpose
01	01	Adj (IL5200G). GND	Adjustment (for IL5200G). Common for rest
02, 04	02	Output	Output
02, 04	03	Output	Output
03	04	Input	Input

Classification parameters for normal climatic conditions

Device	Main function purpose	Classification parameters for normal climatic conditions				
		Parameter, unit	Symbol	mode of measurements	Min.	Max.
IL5200G	Adjustable voltage regulator of positive polarity	Reference voltage, V	U_{ref}	$(U_I - U_O) = 2.0$ V, $I_O = -10$ mA	1.238	1.262
		Adjustment current, µA	I_{Adj}	$U_I \leq 15$ V	-	120
IL5212G		Output voltage, V	U_O	$U_I = 3.2$V, $I_O = -10$ mA	1.188	1.212
		Adjustment current, µA	I_{Adj},	$U_I \leq 15$V	-	120
IL5218G		Output voltage, V	U_O	$U_I = 3.8$ V, $I_O = -10$ mA.	1.78	1.82
		Consumption current, mA	I_D,	$U_I \leq 8.0$ V	-	10
IL5225G		Output voltage, V	U_O	$U_I = 4.5$ V, $I_O = -10$ mA	2.475	2.525
	Voltage regulator of positive polarity with fix output voltage	Consumption current, mA	I_D,	$U_I \leq 10$ V	-	10
IL5228G		Output voltage, V	U_O	$U_I = 4.85$ V, $I_O = -10$ mA	2.82	2.88
		Consumption current, mA	I_D,	$U_I \leq 10$ V	-	10
IL5230G		Output voltage, V	U_O	$U_I = 5.0$ V, $I_O = -10$ mA	2.97	3.03
		Consumption current, mA	I_D,	$U_I \leq 12$ V	-	10
IL5233G		Output voltage, V	U_O	$U_I = 5.3$ V, $I_O = -10$ mA	3.267	3.333
		Consumption current, mA	I_D,	$U_I \leq 15$ V	-	10
IL5250G		Output voltage, V	U_O	$U_I = 7.0$ V, $I_O = -10$ mA	4.95	5.05
		Consumption current, mA	I_D,	$U_I \leq 15$ V	-	10

INTEGRAL

Electric features of IL5200G (C_O=10 µF)

Parameter, unit	Symbol	Value		Measurement mode	Junction temperature °C
		Min.	Max.		
IL5200G					
Reference voltage, V	U_{ref}	1.238	1.262	$U_I - U_O = 2.0$ V, $I_O = -10$ mA.	25±10
		1.225	1.275	1.4 V $\leq (U_I-U_O) \leq 10$ V -10 mA$\leq I_O \leq$ -800*	0÷125
Line regulation, %	ΔU_{OU}	-	0.2	$I_O = -10$ mA 1.5 V $\leq (U_I-U_O) \leq 13.75$ V	0÷125
Load regulation, %	ΔU_{OI}	-	0.4	$U_I - U_O = 3.0$V, -10 mA$\leq I_O \leq$ -800mA	
Drop-out voltage, V	U_{DS}	-	1.1	$I_O = -100$ mA	
			1.15	$I_O = -500$ mA	
			1.2	$I_O = -800$ mA	
Maximum output current, mA	I_{Omax}	800	1300	$U_I - U_O = 5$V	25±10
Minimum output current, mA	I_{Omin}	-	5	$U_I = 15$V	0÷125
Adjustment current, µA	I_{Adj}	-	120	$U_I \leq 15$V	
Adjustment current change, µA	ΔI_{Adj}	-	5	1.4 V $\leq (U_I-U_O) \leq 10$V -10 mA $\leq I_O \leq$ -800mA	
Supply voltage rejection, dB	SVR	60	-	$U_I - U_O$ =3V, $I_O = -40$mA, f=120 Hz, $U_r = 1$ V** (peek-to-peek)	25±10
Thermostability, %/W	Regterm	-	0.1	t = 30 ms, T_A=25 °C	-

Electric features of IL5212G

Parameter, unit	Symbol	Value		Measurement mode	Junction temperature °C
		Min.	Max.		
IL5212G					
Output voltage, V	U_O	1.188	1.212	$U_I - U_O = 3.2$ V, $I_O = -10$ mA,	25±10
		1.140	1.260	1.4 V $\leq (U_I-U_O) \leq 10$ V -10 mA$\leq I_O \leq$ -800mA*	0÷125
Line regulation, %	ΔU_{OU}	-	0.2	$I_O = -10$ mA 1.5 V $\leq (U_I-U_O) \leq 13.75$ V	0÷125
Load regulation, %	ΔU_{OI}	-	0.4	$U_I - U_O = 3.0$V, -10 mA$\leq I_O \leq$ -800mA	
Drop-out voltage, V	U_{DS}	-	1.1	$I_O = -100$ mA	
			1.15	$I_O = -500$ mA	
			1.2	$I_O = -800$ mA	
Maximum output current, mA	I_{Omax}	800	1300	$U_I - U_O = 5$V	25±10
Minimum output current, mA	I_{Omin}	-	5	$U_I = 15$V	0÷125
Adjustment current, uA	I_{Adj}	-	120	$U_I \leq 15$V	
Adjustment current change, µA	ΔI_{Adj}	-	5	1.4 V $\leq (U_I-U_O) \leq 10$V -10 mA $\leq I_O \leq$ -800mA	
Supply voltage rejection, dB	SVR	60	-	$U_I - U_O$ =3V, $I_O = -40$mA, f=120 Hz, $U_r = 1$ V** (peek-to-peek)	25±10
Thermostability, %/W	Regterm	-	0.1	t = 30 ms, T_A=25 °C	-

Electric features of IL5218G, IL5225G, IL5228G,IL5230G, IL5233G, IL5250G (C_O=10 µF)

Parameter, unit		Symbol	Value		Measurement mode	Junction temperature °C
			Min.	Max.		
IL52XXG						
Output voltage, V	IL5218G	U_O	1.78	1.82	U_I = 3.8 V, I_O = -10 mA	25±10
			1.76	1.84	3.3 V ≤ U_I ≤ 8.0 V 0 mA≤ I_O ≤ -800 mA*	0÷125
	IL5225G		2.475	2.525	U_I = 4.5 V, I_O = -10 mA	25±10
			2.45	2.55	3.9 V ≤ U_I ≤ 10 V 0 mA≤ I_O ≤ -800 mA*	0÷125
	IL52228G		2.82	2.88	U_I = 4.85 V, I_O = -10 mA	25±10
			2.79	2.91	4.25 V ≤ U_I ≤ 10 V 0 mA≤ I_O ≤ -800 mA*	0÷125
	IL5230G		2.97	3.03	U_I = 5.0. V, I_O = -10 mA	25±10
			2.94	3.06	4.5 V ≤ U_I ≤ 10 V 0 mA≤ I_O ≤ -800 mA*	0÷125
	IL5233G		3.267	3.333	U_I = 5.3 V, I_O = -10 mA	25±10
			3.235	3.365	4.75 V ≤ U_I ≤ 10 V 0 mA≤ I_O ≤ -800 mA*	0÷125
	IL5250G		4.95	5.05	U_I = 7.0 V, I_O = -10 mA	25±10
			4.9	5.1	6.5 V ≤ U_I ≤ 15 V 0 mA≤ I_O ≤ -800 mA*	0÷125
Line regulation, %	IL5218G	ΔU_{OU}	-	6.0	3.3 V≤ U_I ≤ 8.0 V, I_O = 0 mA	0÷125
	IL5225G		-	6.0	3.9 V≤ U_I ≤ 10 V, I_O = 0 mA	
	IL52228G		-	6.0	4.25 V≤ U_I ≤ 10 V, I_O = 0 mA	
	IL5230G		-	6.0	4.5 V≤ U_I ≤ 12 V, I_O = 0 mA	
	IL5233G		-	6.0	4.75 V≤ U_I ≤ 15 V, I_O = 0 mA	
	IL5250G		-	10	6.5 V≤ U_I ≤ 15 V, I_O = 0 mA	
Load regulation, %	IL5218G	ΔU_{OI}	-	10	U_I = 3.3V, 0мА≤ I_O ≤ -800mA	0÷125
	IL5225G		-	10	U_I = 3.9V, 0mA ≤ I_O ≤-800mA	
	IL52228G		-	10	U_I = 4.25V, 0mA≤I_O≤-800mA	
	IL5230G		-	10	U_I = 4.5V, 0mA≤ I_O ≤ -800mA	
	IL5233G		-	10	U_I = 4.75V, 0mA≤I_O≤-800mA	
	IL5250G		-	15	U_I = 6.5V, 0mA≤ I_O ≤ -800mA	
Drop-out voltage, V		U_{DS}	-	1.1	I_O = -100 mA	
				1.15	I_O = -500 mA	
				1.2	I_O = -800 mA	
Maximum output current, mA	IL5218G	I_{Omax}	800	1300	U_I = 6.8 V	25±10
	IL5225G		800	1300	U_I = 7.5 V	
	IL52228G		800	1300	U_I = 7.85 V	
	IL5230G		800	1300	U_I = 8.0 V	
	IL5233G		800	1300	U_I = 8.3 V	
	IL5250G		800	1300	U_I = 10 V	

Electric features of IL5218G, IL5225G, IL5228G, IL5230G, IL5233G, IL5250G (C_O=10 μF)

Parameter, unit		Symbol	Value		Measurement mode	Junction temperature °C
			Min.	Max.		
Maximum consumption current, mA	IL5218G	I_D	-	10	$U_I \le 8.0$ V	0÷125
	IL5225G		-	10	$U_I \le 10$ V	
	IL52228G		-	10	$U_I \le 10$ V	
	IL5230G		-	10	$U_I \le 12$ V	
	IL5233G		-	10	$U_I \le 15$ V	
	IL5250G			10	$U_I \le 15$ V	
Supply voltage rejection, dB	IL5218G	SVR	60	-	I_O = -40 mA, f=120 Hz, U_r = 1 V** (peek-to-peek) U_I = 5.5 V	0÷125
	IL5225G				I_O = -40 mA, f=120 Hz, U_r = 1 V** (peek-to-peek) U_I = 5.5 V	
	IL52228G				I_O = -40 mA, f=120 Hz, U_r = 1 V** (peek-to-peek) U_I = 5.85 V	
	IL5230G				I_O = -40 mA, f=120 Hz, U_r = 1 V** (peek-to-peek) U_I = 6.0 V	
	IL5233G				I_O = -40 mA, f=120 Hz, U_r = 1 V** (peek-to-peek) U_I = 6.3 V	
	IL5250G				I_O = -40 mA, f=120 Hz, U_r = 1 V** (peek-to-peek) U_I = 8.0 V	
Thermostability, %/W			-	0.1	t = 30 ms, T_A=25 °C	-

Note

1. List of parameters, norms and mode of measurements can be revised during the development

2. Measurement of a output voltage at the control of electric parameters over a output current more than 200 мА applied carry out in a pulse mode not earlier, than 1 ms after mode is defined. Duration of pulses is not more than 5 ms, porosity not less than 10.
3. Mark "minus" before value of a current means only its direction (a output current). Absolute value of indicated on a current measuring device is accepted as value of a current

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 * Norms and modes for a current of load 1 A are specified on an experimental batch
** It is permitted to measure SVR at U_I = 3 V (peek-to-peek), thus the norm of parameter SVR is specified on an experimental batch

INTEGRAL

Maximum & absolute maximum ratings

Parameter, unit		Symbol	Absolute maximum ratings		Maximum ratings	
			Min.	Max.	Min.	Max.
Input voltage, V	IL5200G	U_I	2.475	15	-	16
	IL5212G		2.46	15		
	IL5218G		3.04	8		
	IL5225G		3.75	10		
	IL52228G		4.11	10		
	IL5230G		4.26	12		
	IL5233G		4.565	15		
	IL5250G		6.3	15		
Thermal resistance junction-case, ^{o}C/W		R_{TJC}	-	15*	-	15*
Thermal resistance junction-ambient, ^{o}C/W		R_{TJA}	-	156*	-	156*

Note

R_{TJC} и R_{TJA} values can be revised during the development

For the device with additional external heat sink thermal resistance junction-ambient is calculated by formula:

$$R_{TJA} = R_{TJC} + R_{TJCA}, \tag{1}$$

R_{TJC} – thermal resistance junction-case of the device, ^{o}C/W

R_{TJCA} – thermal resistance junction-ambient of the device, ^{o}C/W

Used heat sink, mode of switch-on (power consumption) & ambient temperature have to provide junction temperature not more than $T_J \leq 125$ ^{o}C

Maximum permissible power P_{tot}, W, dissipated by the device for ambient temperature T_A, is calculated by formula:
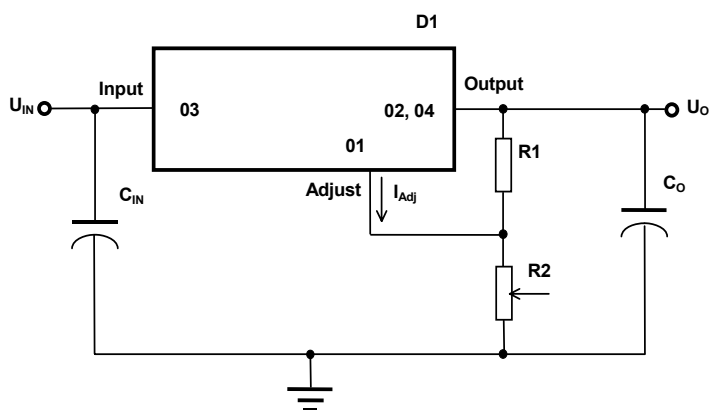
$$P_{tot} = (125 - T_A) / R_{TJA}, \tag{2}$$

125 – is maximum permissible operating junction temperature, ^{o}C

Typical values of electric parameters

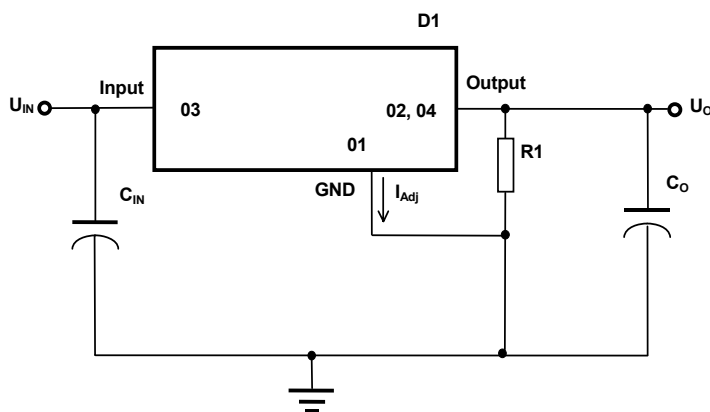| Parameter	Symbol	Measurements mode	Value	Unit
Temperature coefficient of voltage non-stability, IL5212G	TS	$T_J = 0 \div 125$ ^{O}C	1.0*	%
Temperature coefficient of voltage non-stability, IL5200G, IL5218G, IL5225G, IL5228G, IL5230G, IL5233G, IL5250G			0.5*	
Time coefficient of output voltage non-stability	S	1000 Hours $T_J = 125$ ^{O}C (for check-out)	0,3	%
Output noise voltage, (% of U_O), IL5212G, IL5200G,	$U_{n\,rms}$	$T_J = 25$ ^{o}C 10 Hz $\leq$ f $\leq$ 10 kHz	0.003	%
Output noise voltage, IL5218G, IL5225G, IL5228G, IL5230G, IL5233G, IL5250G			100	µV
Note * - values can be revised during the development				

IL5200G application diagram

D1 – integrated circuits
R1 – resistor 120 Ohm ± 1 %,
R2 - trimmer resistor with accuracy 1 %.
Output voltage U_O , V, is calculated by formula:

$$U_O = U_{ref}(1 + \frac{R2}{R1}) + I_{Adj}R2 ,$$
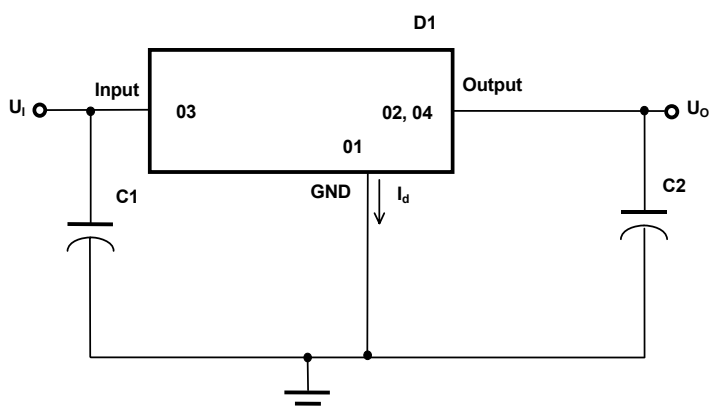
U_{ref} - reference voltage, V,

I_{Adj} - adjustment current, μA.
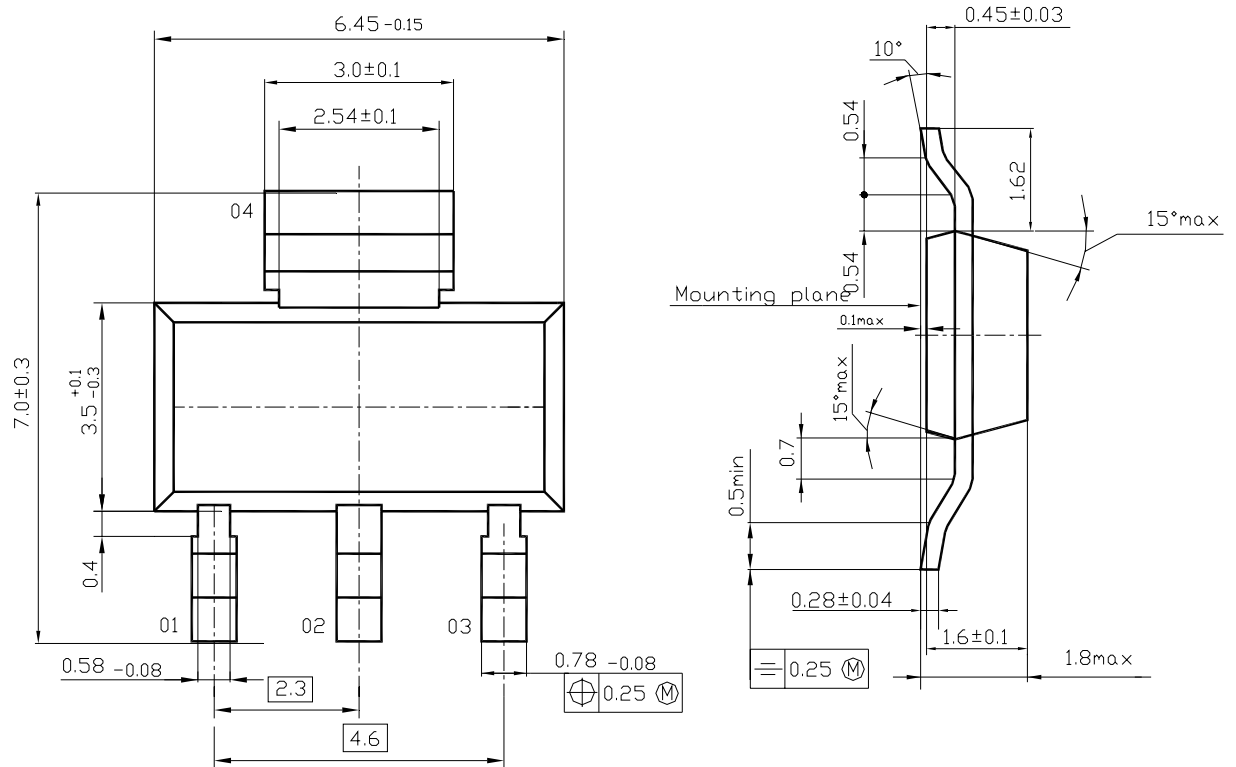
IL5212G application diagram

C1 – capacitor 100 nF±1 %
C2 - capacitor 10 μF±1 %
D1 – integrated circuit,
R1 – resistor 120 Ohm ± 1 %

Application diagram of fixed voltage regulators family IL52XXG

C1 – capacitor 100 nF
C2 - capacitor 10 μF,
D1 – integrated circuit

INTEGRAL

Package dimension

PAD LOCATION TABLE

Chip designation & size (X x Y, μm)	Pad number	Coordinates of the contact pad				Contact pad , um (by passivation layer)
		Left bottom corner		Right top corner		
		X, μm	y, μm	X, μm	y, um	
SKFN.757648.297 (1330 x 1170)	01	94	976	194	1076	100 x 100
	02	94	94	194	194	100 x 100
	03	623.5	102.5	831.5	202.5	208 x 100
	04	1166	255.5	1266	463.5	100 x 208
	05	1194	734	1266	809	75 x 75
	06	1194	885.5	1266	957.5	75 x 75
	07	1194	1034	1266	1106	75 x 75
	08	1045.5	1034	1117.5	1106	75 x 75
	09	897	1034	969	1106	75 x 75

Die drawing